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May 20, 2016

Mr. Michael Mikulka
USEPA – Region 5
77 West Jackson Blvd., LU-9J
Chicago, IL 60604-3590



**Re: Response to USEPA Comments Dated March 22, 2016
Former Coke Plant Area, Pre-Design Work Plan
ArcelorMittal Indiana Harbor LLC West Facility, East Chicago, Indiana
RCRA Docket No. R3013-5-03-002; EPA Facility ID IND 005 462 601**

Dear Mr. Mikulka:

This letter has been prepared in response to the United States Environmental Protection Agency (USEPA) letter dated March 22, 2016, regarding the referenced Former Coke Plant located in East Chicago, Indiana. Based on previous investigation results, additional investigations were conducted in 2012 and 2013 to further evaluate soil, groundwater, and light non-aqueous phase liquids (LNAPL) impacts at the Former Coke Plant. This additional investigative work scope was presented in the USEPA-approved Additional Investigation/Source Evaluation Work Plan (Revision 1) dated March 2011, prepared by the former consultant, AECOM. In January 2014, an Additional Site Investigation Report for the Former Coke Plant was prepared by Ramboll Environ US Corporation (Ramboll Environ), formerly ENVIRON International Corporation (ENVIRON) and submitted to the USEPA. The USEPA provided comments to the January 2014 Additional Site Investigation Report in a letter dated February 21, 2014. ArcelorMittal Indiana Harbor LLC (ArcelorMittal) provided responses to the USEPA's February 2014 comments in a letter dated July 14, 2014. The April 28, 2015 USEPA correspondence provided comments to the July 2014 ArcelorMittal letter and indicated that additional activities needed to be included in a pre-design work plan to address data gaps related to the Former Coke Plant Area. The April 28, 2015 USEPA correspondence further requested that a revised Additional Site Investigation Report, which address the April 2015 USEPA comments, and a Pre-Design Work Plan, be submitted to the USEPA.

In a letter dated August 7, 2015, ArcelorMittal provided final responses to the April 2015 USEPA comments. In an e-mail communication dated August 28, 2015, the USEPA indicated that it was in general agreement with the August 7, 2015 ArcelorMittal response letter, and requested that: 1) the revised Additional Site Investigation Report be submitted to the USEPA within 30 days, and 2) the Pre-Design Work Plan be submitted to the USEPA within 90 days. The revised Additional Site Investigation Report was submitted to the USEPA on September 25, 2015, and the Pre-Design Work Plan was submitted to the USEPA on November 30, 2015. In an e-mail communication dated October 30, 2015, the USEPA provided responses to the revised Additional Site Investigation Report dated September 25, 2015. In a correspondence

dated January 8, 2016, ArcelorMittal provided responses to the October 30, 2015 USEPA e-mail communication. In an e-mail communication dated February 16, 2016, the USEPA provided comments to the January 8, 2016 ArcelorMittal correspondence.

In the letter dated March 22, 2016, the USEPA provided comments to the November 30, 2015 Pre-Design Work Plan. This letter has been prepared to provide responses to the March 22, 2016 USEPA correspondence, along with an amended Pre-Design Work Plan (Revision 1). The USEPA comments are identified below as numbered in the March 22, 2016 USEPA letter, and the corresponding responses are provided below each comment in **bold and italic font**.

GENERAL COMMENTS

- A. EPA previously requested revision of the Conceptual Site Model (CSM) to include the potential for exposures to volatile contaminants migrating from the deeper subsurface into and through the surficial fill to ambient air. The response AM provided did not indicate that the CSM will be revised in this manner, only that the vapor intrusion pathway will be considered in the event that buildings are constructed on the site in the future. EPA reiterates the need to revise the CSM accordingly. We request additional detail on how AM will formally memorialize the need for vapor intrusion evaluations prior to and during occupation of any buildings that may be constructed on the site in the future. Furthermore, the response does not document that AM has appropriately ruled out the possibility of outdoor air quality concerns from VOCs to site workers parking vehicles or performing remediation activities. EPA requires that additional discussion on this potential exposure pathway be provided, and the soil to ambient air exposure pathway be investigated during the pre-design effort. The inhalation route is not controlled/prevented by restrictive covenants (see Figure 3 of the Additional Site Investigation Report and Figure 2-1 of Appendix C of the Pre-Design Work Plan).

The Pre-Design Work Plan should be revised to specify that AM conduct additional sampling and analysis for VOC constituents in the overlying fill, rather than merely concluding that no current exposure pathway exists. EPA does not consider PID/FID readings as adequate to characterize the concentration of VOC contaminants in the fill material. The resulting data collected can then be compared to human health screening levels for the inhalation pathway as part of the risk assessment for the CMS.

Response: The site-wide Conceptual Site Model Diagrams (Figures 3 and 2-1) have been revised to take into account potential exposure from migration of VOCs for current and future site workers at the site surface of the Coke Plant. Because new slag fill was placed at the surface of the Coke Plant in recent years and PID/FID screening did not indicate VOCs were a concern, we continue to assert that the possibility for outdoor air quality concerns due to the shallow slag fill is very remote. However, in an effort to move the project forward, the third sentence from the bottom of the paragraph in Section 4.2.8 (Site Wide Surficial Soil) of the Pre-Design Work Plan has been revised to read as follows: "To further evaluate the uppermost 2 feet of soil across the site for direct contact and outdoor air quality evaluation, soil samples will be obtained from the new soil borings and monitoring well borings (Figure 10) from the 0 to 2 foot sampling interval, and submitted for laboratory analysis of PAHs and VOCs." In addition, Table 6 has been revised to reflect the additional VOC

analysis. The resulting data will then be compared to human health screening levels for the inhalation pathway as part of the CSM.

- B. In EPA's approval letter for the coke plant investigation report dated February 16, 2016, modification (c), EPA previously noted in Specific Comment 2, that logs for borings SB-880 and SB-881 suggest the presence of light non-aqueous phase liquid (LNAPL) at a depth of roughly 8 feet below ground surface. While the AM response correctly noted that the upcoming pre-design investigation will include further evaluation of the extent of LNAPL near the former benzol storage area, as shown on Figures 10 and 11 from the Pre-Design Investigation Work Plan, the proposed LNAPL investigation (including laser induced fluorescence [LIF] and monitoring well installation) does not extend far enough to the southeast to intercept the area around borings SB-880 or SB-881. Accordingly, we recommend that additional LIF borings and at least one well be advanced to ensure that any LNAPL around and down-gradient of boring SB-881 will be properly delineated during the investigation.

Response: The information previously contained on Figures 10, 11 and 12 has been combined into a single revised Figure 10, which indicates that the area of the LIF investigation will extend to locations downgradient of SB-880 and SB-881. Revised Figure 10 also indicates a preliminary location of an additional well (MW-839S) downgradient of SB-881. The last paragraph in Section 4.2.2.1 is followed by the following new paragraph: "Based on the results of the LIF investigation, an additional monitoring well will be installed at the preliminary location identified as MW-839S on Figure 10. The purpose of new monitoring well MW-839S is to confirm the downgradient extent of LNAPL. The scope of slag-fill/soil and groundwater sampling related to new monitoring well MW-839S is provided in Sections 4.2.2.2 and 4.2.2.3, respectively."

- C. LNAPL may be a source of numerous dissolved phase contaminants in groundwater at the site. We agree with ArcelorMittal's plan to consider LNAPL removal during the CMS, but also recommend that Section 7.4 (second paragraph) of the Additional Site Investigation Report be revised to clarify that the LNAPL may be the source of numerous contaminants beyond just benzene, toluene, ethylbenzene and xylene (BTEX).

Response: The second paragraph of Section 7.4 of the Additional Site Investigation Report (Revision 3) will be modified as follows: "July 2013 LNAPL samples collected from these two monitoring wells were found to contain petroleum VOCs and PAHs. As such, the LNAPL may represent a source of potential release of these constituents."

SPECIFIC COMMENTS

Section 2.3, Conceptual Site Model, page 12

1. The second paragraph in this section discusses implementation of a deed restriction on the property to ensure that future users understand site risks. The text also notes that the vapor intrusion pathway will also be evaluated in the event that buildings are constructed on the property in the future. Triggers for, and timing of, this risk evaluation should be specifically detailed in the proposed deed restriction.

Response: The second sentence from the bottom of Section 2.3 of the Pre-Design Work Plan has been added to read as follows: "Triggers for, and timing of, a vapor intrusion pathway risk evaluation will be detailed in the proposed deed restriction."

Section 3.3.4, Site-Specific Hydrogeology, page 14

2. ArcelorMittal contends that a low permeability silty clay layer is continuous across the site, serving as an aquitard and limiting downward vertical migration of dissolved phase contamination. To provide further support for this statement, hydrogeologic data obtained during the pre-design investigation should be incorporated into the cross-sections on Figures 4 and 5 prior to submittal of the Pre-Design Report. Two components of the proposed scope of work (e.g., the LNAPL laser-induced fluorescence in the former benzol storage area and installation of wells near MW-822D) involve advancement of borings to depths of 40 feet and should provide further confirmation as to the presence or absence of the referenced clay layer across the site.

Response: *The LNAPL laser-induced fluorescence borings are not anticipated to include collection of soil samples at continuous depth intervals, and their total depths will be based on real-time information obtained in the field. Any relevant soil lithologic information obtained from the laser-induced fluorescence borings, as well as new monitoring well borings MW-832D, MW-834D and MW-835D, will be incorporated into the cross-sections on Figures 4 and 5 as appropriate, prior to submittal of the Pre-Design Report. The last sentence in the first paragraph in Section 3.3.4 of the Pre-Design Work Plan has been added to read as follows: "Any relevant soil lithologic information obtained as part of the Pre-Design scope of work identified herein will be incorporated into the cross-sections on Figure 4 and 5 as appropriate, for inclusion with the Pre-Design Report."*

Section 4.2.2 Former Benzol Storage Area

3. The Section describes how the extent of LNAPL, impacted soil, and impacted groundwater near the benzol storage will be further delineated. To evaluate the extent of impacted soil within the Benzol Storage Area and down-gradient of that area, some additional soil borings are proposed (Section 4.2.2.2). A total of 18 soil samples from six additional monitoring well borings would be obtained and analyzed for target parameters (Table 6). At each of the six boring locations, one soil sample from the upper 2 feet will be collected to evaluate the direct contact exposure pathway by performing analysis of PAHs and metals only. The analysis of those samples is appropriate, but it should be extended to include VOCs to evaluate the potential for volatilization from shallow soils to ambient air. Consequently, the analysis of VOCs should be performed in the shallow soil samples to be collected at SB-884, SB-885, SB-887, SB-888, and SB-892.

Response: *As indicated in the response to General Comment A, the Pre-Design Work Plan has been revised (Section 4.2.8) to indicate that the planned 0 to 2 feet slag-fill/soil samples identified in Table 6 will be submitted for laboratory analysis of VOCs. The resulting data will then be compared to human health screening levels for the inhalation pathway as part of the CSM.*

Section 4.2.2.3, Extent of Impacted Groundwater, page 20

4. This section refers to seven monitoring wells (MW-828S through MW-833S and MW-832D) that will be installed and sampled to further evaluate groundwater quality within the former benzol storage area. Figure 11 shows eight wells to be installed in this area- those listed above, plus MW-838S. However, well MW- 838S is not discussed in the text of the Pre-Design Work Plan. Expand this section to include well MW-838S, or provide clarification as to the specific purpose of this monitoring well.

Response: Section 4.2.2.3 has been revised to include monitoring well MW-838S and MW-839S, for a total of nine wells. Figure 10 has been updated to include the information from Figures 11 and 12 and the location of MW-839S.

Section 4.2.4, Monitoring Well MW-822 Area, pages 20 and 21

5. This section calls for installation of two monitoring wells (MW-834D and MW-835D) to further delineate the extent of arsenic and thallium in groundwater near existing well MW-822. According to Table 6, only surface soil will be sampled at these borings and only for polynuclear aromatic hydrocarbon analysis. It is unclear why surface and subsurface soil from these borings will not also be sampled for arsenic and thallium analyses in an effort to delineate the potential source area for known groundwater contamination. Provide the rationale for this limitation in analytical parameters, or expand the scope of the investigation accordingly.

Response: The site-wide distribution of relatively low concentrations of arsenic and thallium in groundwater is not indicative of a specific arsenic and/or thallium source area near monitoring well MW-822. To respond to this comment, Section 4.2.4 will be followed by the following new paragraph: "To further evaluate soil quality near monitoring well MW-822, three soil samples will be obtained from both of the two additional monitoring well borings (MW-834D and MW-835D) and submitted for laboratory analysis of PAHs, arsenic and thallium, for a total of six soil samples as indicated in Table 6. One of the three soil samples from each of the two additional monitoring well borings will be obtained from the upper 2 feet of the subsurface, to evaluate the direct contact exposure pathway. The second soil sample will be obtained from the 2-foot interval above the water table, and the third soil sample will be obtained from the bottom 2 feet of the borings. The soil samples obtained from the upper 2 feet of the subsurface will also be submitted for laboratory analysis of VOCs."

Section 4.2.8, Site-Wide Surficial Soil, page 21

6. The second paragraph in this section refers to Figure 12 for identification of locations with surface soil contamination above Indiana Department of Environmental Management (IDEM) commercial/industrial direct contact screening levels. The legend for this figure indicates that these locations should be highlighted in yellow, but no highlighting is indicated in the vicinity of previous borings SB-880, SB-881, MW-822D, MW-823D, and MW-826M. Amend the figure to appropriately highlight soil exceedances in this area.

Response: The enclosed revised Figure 12 (now identified as Figure 10) has been corrected.

7. The last sentence in this section indicates that, should new surface soil sampling locations be found to exceed direct contact criteria, additional fill materials may be placed within the former coke plant to render that pathway incomplete. However, it does not appear appropriate to eliminate other potential remedial options (e.g., excavation) at this time. During the corrective measures study (CMS) for this site, a variety of remedial options should be considered and evaluated based on all data obtained to date and through the pre-design field effort.

Response: The last sentence in Section 4.2.8 has been revised as follows: "As part of the CMS for this site, multiple remedial options will be evaluated to address the direct contact, ingestion and inhalation pathways as necessary, based on all data obtained to date and also the pre-design data."

Section 4.3.1, Surfactant Enhanced Recovery, pages 22 through 25

8. On pages 23 and 24, the Work Plan proposes to conduct bench-scale testing using solutions with varying surfactant concentrations and, potentially, incorporating solvents to enhance emulsification. Discussion of field-scale testing on pages 24 and 25 calls for use of a 4% surfactant solution without added solvent. Rather than arbitrarily selecting a surfactant concentration at this time, field testing should be conducted using that surfactant/solvent solution determined to be optimal during bench-scale testing. Provide additional justification for pre-selecting the test solution at this time, or revise the Work Plan to specify the means by which an appropriate surfactant/solvent solution will be selected after bench-scale testing is complete.

Response: The first sentence in Item 4 in Section 4.3.1 has been revised as follows: "It is anticipated that approximately 450 to 1,500 gallons of surfactant and up to approximately 75 gallons of solvent will be mixed with approximately 15,000 gallons of water. The actual amount of surfactant and solvent (if solvent is needed) used as part of the pre-design field-scale testing will be based on their ability to create an emulsion as determined during the bench-scale testing described above."

9. The last two paragraphs in this section indicate that, after the field-scale injection/extraction events are completed, biological amendments will be injected into the subsurface to stimulate natural decomposition of observed hydrocarbons over a period of at least six months. The Work Plan then proposes to collect field data (e.g., LNAPL thickness, pH, dissolved oxygen, oxidation-reduction potential, specific conductivity, ammonia, nitrates, and contaminant concentrations) on a quarterly basis from well MW-820S. Given the short time frame for enhanced biodegradation testing in this location, monthly monitoring of these parameters would appear to be more appropriate. Provide additional justification for quarterly monitoring, or revise the proposed scope of work accordingly.

Response: The text in the last paragraph of this section has been revised to specify collection of the data on a monthly (rather than quarterly) basis over the minimum six-month monitoring timeframe.

Section 4.4.3, Inorganic Constituents, page 32

10. The sentence on this page states that ammonia and chloride are not being carried forward as chemicals of concern for the former coke plant. However, because they are residual

products from the production of coke, ammonia and chloride detections will be considered during the CMS. Clarify the text to explain how the presence or absence of these constituents will affect CMS decision-making. For example, will detections be used as evidence of contamination? Will potential remedial technologies also have to address these two constituents, as well as retained chemicals of concern?

Response: *Ammonia and chloride were addressed in the HHRA and screened out based on comparison with available screening levels with the upper confidence limit on the mean of the data for the 11 wells identified by the USEPA (Table 3-1 Appendix C) of the HHRA. In the ecological assessment, ammonia was screened out (Table 3-1 of Appendix B) and chloride was screened out in the refined surface water screening (Table 4-2 of Appendix B). The results of these analyses lead to the conclusion that the presence of ammonia and chloride in site groundwater will not result in unacceptable risks to human or ecological receptors. The last sentence in Section 4.4.3 will be revised as follows: "The presence of ammonia and chloride will be considered as part of CMS evaluations, to the extent that their presence would affect implementation of remedial actions related to other contaminants."*

Section 5.3.3, Surface Water Levels, page 34

11. This section refers to Figure 6 for the two locations at which surface water levels will be measured in the canal. However, these locations are actually indicated only on Figure 2. Correct the text accordingly.

Response: *Section 5.3.3 has been corrected to indicate Figure 2, rather than Figure 6.*

Section 5.4, Groundwater Sampling, pages 34 and 35

12. Section 5.2 differentiates between screen lengths for water table wells, mid-depth wells, and deep monitoring wells. Step 6 in Section 5.4 should also differentiate between well intake positioning for the three types of wells. Revise the text accordingly.

Response: *Step 6 in Section 5.4 has been revised as follows: "Lower the pump into the well and position the well intake. For the water table wells the pump intake will be placed near the center of the saturated interval of the 10-foot screen, with the bottom of the pump at least 1.5 feet above the bottom of the well and with at least three feet of water over the top of the pump (minimum head requirement). For the mid-depth wells the pump intake will be placed near the center of the 5-foot screened interval. For the deep wells the bottom of the pump will be placed approximately 1.5 feet above the bottom of the well, which will place the pump intake near the top of the 3-foot screened interval."*

Section 5.8, Data Validation, pages 37 and 38

13. The last paragraph in this section states that, if initial rounds of data validation demonstrate that the laboratory reliably produces data of high quality and usability, the level of data quality reporting may be reduced. While this is a potentially acceptable scenario, such a change should only be made with prior EPA approval. Revise the Work Plan to incorporate this condition.

Response: The last paragraph in Section 5.8 will be revised as follows: "All laboratory analytical data (100%) will be validated. If the initial rounds of data validation demonstrate that the laboratory reliably produces data of high quality and usability such that completeness objectives are met or exceeded, then the level of data quality reporting can be reduced from Level IV to Level II, with prior USEPA approval."

APPENDIX B - Expanded Screening Level Ecological Risk Assessment

The conclusions of the ecological risk assessment may need to be revised based on the Specific Comments provided below.

SPECIFIC COMMENTS:

1. Page 11, Section 2.2.1: It is unclear if the individual low molecular weight (LMW) PAHs and the individual high molecular weight (HMW) PAHs were added together (a total for the LMW PAHs and a total for the HMW PAHs) to assess their cumulative risk. The text notes their common mechanism of action and states that they are "grouped together;" however, it is not clear if the individual risks for each type of PAH were ultimately evaluated cumulatively.

Response: Additional text has been added to explain that concentrations of the individual LMWPAHs in a given sample were summed to yield that sample's LMWPAH concentration and the concentrations of individual HMWPAHs in that sample also were summed to yield that sample's HMWPAH concentration. Those respective LMWPAH and HMWPAH concentrations were then compared to a single benchmark based on the most conservative value for all PAHs in the respective group.

2. Page 11, Section 2.2.2: EPA does not agree with the rationale for not selecting a fish-tissue based TRV for PAHs. It is true that fish are able to metabolize PAHs, however studies have also shown that the action of metabolizing the PAHs increases the incidence of tumors including, liver neoplasia, hepatic carcinoma, and hyperplastic disease. Please revise to include a fish-tissue based TRV for PAHs.

Response: USEPA's point is accurate and explains why incidence of deformities, eroded fins, lesions and tumors (DELTs) are typically used to evaluate risks posed by PAHs to fish. However, in this case DELTs are not available nor would they be helpful, given that fish likely spend limited time in the canal, such that it would not be possible to discern whether any DELTs observed resulted from exposure within the canal or elsewhere or a combination. We have searched extensively for a literature-derived fish tissue-based TRV for PAHs and have found none. The absence of suitable information is a second reason for not deriving a TRV in this case. Text has been added to this section to explain the above.

3. Page 12, Section 2.2.2: Dyer et al (2000), the source for fish tissue based TRVs for cadmium, copper, and selenium, is not acceptable to EPA. The study was an investigation of approaches and paradigms currently advocated for ecological risk assessment and was not conducted to develop fish tissue based TRVs. A potential source for TRVs is the 1996 Oak Ridge National Laboratory (ORNL) document which can be found at:

<https://rais.ornl.gov/documents/tm96r2.pdf>. Please revise the risk analysis for these 3 COCs for fish.

Response: *The ORNL document suggested by EPA only provides benchmarks based on water concentrations. It offers no information regarding fish tissue TRVs and therefore is not a useful alternative to Dyer. Theoretically, we might directly use ERED, the source for the data underlying Dyer's analysis. However, ERED has been down for months and we don't know when it is likely to be available again. For these reasons, the text has been revised to acknowledge the different objective of Dyer and the uncertainty that contributes to the analysis.*

4. Page 12, Section 2.2.3: Allometric scaling is no longer recommended by EPA in ERAs. However, since it was already applied in this instance, EPA will accept its use. Future ERAs should not use allometric scaling.

Response: *This comment indicates that no change is required but notes that allometric scaling is not appropriate in ecological risk assessment. It warrants noting that this report does not use allometric scaling. Text has been added to a footnote to clarify the difference between converting from a dietary concentration to a dose and allometric scaling.*

5. Page 13, Section 2.2.3: It is unclear why 1.53 mg/kg-day was chosen as the avian TRV for cadmium. The March 2005 Interim Final Eco-SSL document for cadmium lists the TRV as 1.47 mg/kg-day. In addition, the selected avian TRV for selenium is 0.09 mg/kg-day as opposed to 0.290 mg/kg-day which is the TRV listed in the July 2007 Interim Final Eco-SSL document for selenium. Please explain. Please revise the risk analysis for these 3 COCs for avian receptors.

Response: *The report has been revised to use the TRV recommended in the eco-SSL, rather than doing an independent analysis of the studies that underpin the eco-SSL.*

6. Page 13, Section 2.2: EPA requests that additional references be provided for the TRV for PAHs in birds. There has been some concern that the Patton and Dieter 1980 TRV was skewed due to a lower food intake by the birds in the study due to a decrease in the palatability of the food due to the addition of the PAHs. Although the EcoSSLs did not have enough studies per their procedures to develop a TRV for PAHs in birds, the studies that were peer reviewed and approved by the EcoSSL team may serve useful for our purposes.

Response: *Although Patton and Dieter has limitations, it remains the only study available upon which to evaluate the effects of PAHs on birds. If we do not use it, then we would not be able to quantitatively estimate risks to birds from exposure to PAHs, which would result in greater uncertainty than is contributed by the study. Text has been added to clarify the uncertainties associated with the Patton and Dieter study and explain why it is used despite those uncertainties.*

In addition, during the course of making the revisions to the Expanded SLERA based on the comments listed above, we identified transcription errors for the BCF equations applied to copper, HMWPAHs, and LMWPAHs. Correcting those

transcription errors resulted in changes to the modelled fish tissue concentrations for those constituents, as well as to the predicted risks for fish and Great Blue Herons.

APPENDIX C: Focused Human Health Risk Assessment (November 2015)

Section 2.1 Conceptual Site Model (CSM)

1. Figure 2-1 is described as the CSM diagram for the Focused HHRA. However, that Figure appears to be a CSM for the entire Coke Plant Site. An explanation should be provided for which part of the Figure applies to the Focused HHRA, or alternatively, a CSM diagram for the Focused HHRA should be provided.

Response: The comment indicates that Figure 2-1 appears to be a CSM for the entire Coke Plant Site, but the figure in Appendix C has only human receptors and is focused only on human exposure pathways at the site. We will revise the text to state Figure 2-1 of Appendix C.

2. Page 5: The language at top of this page states that volatile constituents in subsurface soil and groundwater could migrate to air. The conclusion is reached that exposure to volatile constituents in ambient air or indoor can be considered incomplete because site workers are not present and their presence can be prevented by institutional controls. Please refer to the previous comment above recommending that the site-wide Conceptual Site Model Diagram should be revised to take into account potential exposure from migration of VOCs for all potential workers at the site surface of the Coke Plant, since the Inhalation Route of exposure is not controlled/prevented by restrictive covenants.

Response: As indicated above in the response to General Comment A, the site-wide Conceptual Site Model Diagrams (Figures 3 and 2-1) have been revised to take into account potential exposure from migration of VOCs for all potential workers at the site surface of the Coke Plant. In addition, the Pre-Design Work Plan has been revised to indicate that all of the planned slag-fill/soil samples identified in Table 6 will be submitted for laboratory analysis of VOCs. The resulting data will then be compared to human health screening levels for soil for the inhalation pathway as part of the CMS.

Section 2.3 Potential Human Receptor Groups and Exposure Pathways

3. Page 6: The language states that because some constituents that move from groundwater to surface are bioaccumulative, there is a potential for bioaccumulation from surface water to fish. Because the Indiana Harbor Canal itself is not expected to be a significant fishing location or to support a fishery, the conclusion is reached that consumption of fish by a recreator cannot be a complete pathway. However, migration of fish within the Canal and out to Lake Michigan may be a possibility. Please provide additional rationale for concluding that consumption of fish which migrate in the Canal and uptake constituents cannot be complete pathway for the wider local recreational area, and therefore, that a screening level evaluation for fish consumption is not needed. Was an estimate of uptake for bioaccumulative contaminants in fish performed for the Screening Level Ecological Assessment?

Response: Risk-based concentrations for fish consumption were derived using the USEPA regional screening level calculator and also using an assumed consumption rate of 32 g/day, which represents 50 eight ounce meals of fish per year and also assuming a hazard quotient of 1 or an excess cancer risk level of 1E-06. These risk-based concentrations for consumption of fish were compared with estimated fish tissue concentrations derived using the same bioconcentration factors that were used in the ecological risk assessment. Analyses were done using both the 95% upper confidence limit on the mean (UCL) concentration for the 11 wells identified by the EPA (Step 6), which identified estimated arsenic concentrations greater than the RBC for fish consumption. In Step 7, the fish tissue concentration for arsenic was estimated based on the groundwater UCL from the nine wells thought to be more representative of the plume from the site and the dilution factor of 3,250 as detailed in Attachment 3 of the SLERA. This estimated tissue concentration was not higher than the RBC. These analyses are detailed in the revised HHRA in Appendix C.

Section 3.1.2 Derivation of Risk-based Concentrations (RBCs) for Groundwater Constituents

4. The identification of a recreational visitor as the likely receptor for surface water contaminants is appropriate. The exposure scenario for receptor contact with surface water regarding frequency of exposure per year and multi-year exposure events can be regarded as adequately conservative. The use of a target cancer risk of 1E-06 and a Hazard Quotient of 1 is considered conservative for the derivation of RBCs for the constituents. The calculation of RBCs employing the EPA Regional Screening Level calculator is consistent with the use of EPA Guidance (Attachment 1 and Table 3-1).

Response: Comment noted.

Section 3.2 Estimated Surface Water Concentrations

5. To estimate surface water concentrations from discharge of constituents from starting groundwater concentrations, a series of steps was performed that were designed to prevent the underestimation of potential surface water concentrations for comparison to the Risk Based Concentration Levels calculated in Section 3.1.2. In steps 1 through 3 of the screening, maximum detected constituent concentrations in groundwater were used as possible surrogates for actual surface water constituent concentrations. Then the surrogate concentrations were compared to the Risk-Based Concentration Levels. That methodology is adequately conservative.

Response: Comment noted.

6. After Step 3, four constituents remained with maximum surrogate surface water concentrations above their respective MCLs or Risk-Based Concentration Levels (i.e., benzene, arsenic, ammonia, sulfate). Consistent with previous EPA comments, Step 4 was performed by calculating the 95% Upper Confidence Limit of the Mean (95% UCL) of the groundwater data from wells proximate to the sheet pile wall and from wells which define the benzene plume. The appropriate set of 11 wells was selected for the analysis (page 8). The 95%UCL values were calculated using the EPA ProUCL software (Version 5; 2013), which is appropriate. However, the following items should be addressed:

- a. After the Kaplan-Meier Method was used to account for non-detect concentrations, the BCA Bootstrap method value was used as the estimated 95% UCL. Provide a rationale for why the BCA Bootstrap value was selected rather than the suggested/recommended UCL value calculated by the ProUCL software.

Response: *We calculated the 95% UCLs using the ProUCL software (USEPA 2013). ProUCL calculates 95% UCLs using a large number of alternative methods, including both parametric and nonparametric methods. Parametric methods are based on the assumption that the data are consistent with a standard statistical distribution, such as normal, log-normal, or gamma. Nonparametric methods do not require any assumptions about the distribution. Because of the difficulty of reliably testing whether an environmental dataset fits one of the standard statistical distributions, nonparametric methods are often preferred, particularly when the dataset contains non-detects.*

From the alternative methods included in ProUCL, we identified a single method that is appropriate for estimating EPCs for most data sets such that a consistent method could be used for all UCL calculations. For data sets with eight or more results, we selected the 95% UCL estimated using the bias-corrected accelerated (BCA) bootstrap method. Where TEQ values were not based on any detected congeners, the 95% UCL is based on the KM (BCA) method to account for the nondetect values. The BCA bootstrap method is robust enough to handle any typical environmental dataset, except in cases for which there are less than 8 reported values (USEPA 2013).

- b. For benzene and arsenic, two or more samples were reported as "non-detect" concentrations (Table 3-1). However, the detection limit/sample quantitation limits associated with the non-detect values was not listed. The detection limit/sample quantitation limits for those samples should be provided in order to compare those limits to the lowest detected concentration values.

Response: *A footnote has been added to Table 3-1 to state: "Detection limits for arsenic in undetected samples were <0.00015 mg/L and detection limits for benzene ranged from <0.00008 mg/L to <0.00017 mg/L."*

The undetected data are provided as follows:

Summary of Arsenic and Benzene Non-Detects in Table 7 Groundwater Sample Laboratory Results						
	MW-810S	MW-826S	MW-826S	MW-809S	MW-809S	MW-803S
Parameter (mg/L)	7/16/2013	11/2/2012	7/16/2013	11/2/2015	7/15/2013	7/17/2013
Benzene	<0.00008	<0.00017	<0.00008	<0.00017	<0.00008	--
Arsenic	--	--	--	<0.00015	--	<0.00015

7. After Step 4, only benzene remained as a constituent with a surrogate surface water concentration above its respective Risk-Based Concentration Level. In part 1 of Step 5, an additional evaluation was performed for benzene which was proposed to represent a more

realistic approach for estimating a surface water concentration for benzene. In this Step, groundwater from the two deep wells (MW-8080 and MW-8090) was considered as not likely to contribute to groundwater discharge to the Canal via the breach in sheet pile wall based on the depth to groundwater and their location in lower permeability silts and fine grained sands. In the re-evaluation, the benzene data from those two wells was omitted from the benzene 95%UCL calculation. However, the refined ProUCL calculation value could not be located in the text description or in Table 3-1. The following items should be addressed:

- a. The calculated refined ProUCL value and ProUCL work sheet should be provided along with an indication of whether the calculated UCL value is above or below the Risk-Based Concentration Level for benzene.

Response: The ProUCL output for this calculation is provided in the SLERA Attachment 1 and SLERA Table 4-3, but it will be provided as part of Appendix C. As indicated in the draft HHRA, this estimated exposure point concentration of 0.0048 mg/L for benzene is lower than the unadjusted RBC of 0.281 mg/L for benzene, and the unadjusted MCL for benzene of 0.005 mg/L. For this reason, benzene is not identified for further evaluation.

- b. Provide the depth at which groundwater is screened in MW-808D and MW-809D and the depth to groundwater at those locations (page 9). Also, provide the references to which site groundwater studies included the determination of mean geometric hydraulic conductivity for the wells used in the HHRA report. Does the value for mean hydraulic conductivity of shallow wells apply specifically to the wells near the breach and the benzene plume, or more generally to the shallow wells across the site?

Response: Monitoring well MW-808D is screened from 38.8 to 41.8 feet below ground surface (bgs), and monitoring well MW-809D is screened from 36.5 to 39.5 feet bgs. The measured depth to groundwater at MW-808D has ranged from 11.03 to 13.51 feet below top of casing. The measured depth to groundwater at MW-809D has ranged from 12.96 to 14.63 feet below top of casing. The geometric mean hydraulic conductivity values for the wells used in the HHRA report were documented in the 2008 AECOM "Supplemental Site Investigation Report" for the Former Coke Plant. The mean hydraulic conductivity value for the shallow wells (3.09×10^{-2} cm/s) is based on the results of hydraulic testing of all 10 shallow monitoring wells that were subjected to in-situ hydraulic conductivity testing. The geometric mean hydraulic conductivity value for deep wells MW-808D and MW-809D is 4.58×10^{-3} cm/s. As such, the HHRA concludes that groundwater flow rates through the lower silts are on the order of 85% less than through the upper sands. The geometric mean hydraulic conductivity value for all 8 deep wells that were subjected to in-situ hydraulic conductivity testing is 2.57×10^{-3} cm/s. Based on this value, groundwater flow rates through the lower silts are on the order of 92% less than through the upper sands.

8. In part 2 of Step 5, a summary description is provided for the derivation of groundwater to surface water dilution factor using the estimated groundwater discharge rate from the site and the estimated surface water flow rate in the Indiana Harbor Canal. The derivation of the dilution factor is present in a Technical Memorandum as Attachment 3 of the Screening

Level Ecological Risk Assessment. A groundwater-to-surface water dilution factor value of 3250 was derived from the evaluation. In the final step of the evaluation, the refined 95%UCL groundwater concentration for benzene from the nine wells which contribute the discharge to the Canal was divided by the derived dilution factor of 3250 to estimate an exposure point concentration for human receptor contact with surface water in the Canal. The resulting exposure point concentration of 4.8 micrograms/Liter is less than the MCL for benzene (5 ug/L) and the scenario-specific Risk-Based Concentration for benzene (281 ug/L; APPENDIX C; Attachment 1). Based on those results, it was concluded that the discharge of benzene to the Canal would not result in any significant human health risk.

For the purpose of transparency and to support the conclusion reached in the Focused HHRA, the following items should be addressed:

- a. Provide an explanation for how groundwater-to-surface water dilution factor estimates are typically conducted, including reference to any specific guidance for conducting such estimates (e.g., EPA, ITRC, Indiana Department of Environmental Management).

Response: An example reference concerning methodology to estimate groundwater-to-surface water dilution factors is provided in Michigan Department of Environmental Quality (MDEQ) Operational Memorandum No. 5, dated September 30, 2004. As indicated therein, chronic mixing zone criteria are calculated based on dilution of the maximum discharge flow of venting groundwater and the allocated low flow value of the receiving surface waters. MDEQ Operational Memorandum No. 5 further indicates that the maximum discharge rate of venting groundwater is calculated using Darcy's Law, consistent with the approach documented in Attachment 3 of the Expanded Screening Level Ecological Risk Assessment.

- b. Provide a clarification on whether the dilution factor derivation in the Technical Memorandum is equivalent to a "mixing zone" derivation, or how the two derivations differ.

Response: As indicated in the MDEQ Operational Memorandum No. 5 identified above, a mixing zone is the portion of a surface water body in which venting groundwater is mixed with receiving groundwater. Therefore, the dilution factor derivation in the Technical Memorandum is equivalent to a mixing zone derivation.

- c. Provide an explanation of where the exposure point concentration for benzene is assumed to be located in the Canal after dilution (e.g., at the breach sheet in pile wall; at the outlet of the Canal to Indiana Harbor; at the outlet of the Harbor to Lake Michigan?).

Response: Based on extremely low groundwater seepage rates relative to surface water flow rates, the exposure point concentration for benzene is at the breach in the sheet pile barrier. It should also be noted that, as an additional conservative assumption, the 95% UCL groundwater concentration for benzene from the nine wells that contribute discharge to the Canal is assumed to be representative of the entire 1,300 feet of Former Coke Plant site Canal shoreline. Based on investigative data obtained to date, the cross-sectional area of detectable benzene

concentrations in groundwater is substantially less than the entire Former Coke Plant site shoreline.

Attachment 3. Technical Memorandum: Estimated Groundwater Discharge to Surface Water Dilution Factor.

The use of no greater than 25% of the stream design flow is provided for in the Indiana regulations (327 IAC 5-2-11.4) when deriving dilution fractions (not factors) for constituent concentration comparison against chronic ecological criteria. The stream design flow is defined as the seven day, ten year low flow as specified at Section 11.4(b)(3)(A). Considerations for acute toxicity (in the same section of the regulations) specify that the stream design flow to be used is the 1-day, 10-year low flow. It is not clear how the flows specified in Attachment 3 relate to the stream design flows specified in the Indiana rules. Please explain, and if necessary, revise the calculations.

Response: The stream design flow defined as the 7-day, 10-year low flow as specified at Section 11.4(b)(3)(A) is applied for purposes of deriving total maximum daily loads (TMDLs), wasteload allocations (WLAs) in the absence of TMDLs, and preliminary WLAs. The stream design flow identified in Attachment 3 is provided pursuant to a mixing zone demonstration. However, in response to this comment, the estimated 7-day, 10-year low flow rate is 455 cfs, and the estimated 1-day, 10-year low flow rate is 431 cfs. The use of 25% of the stream design flow for constituent concentration comparison against chronic ecological criteria (455 cfs) would therefore result in a flow rate of 114 cfs, which could be applied as part of the groundwater-to-surface water dilution factor evaluation as discussed below (in response to the second to last USEPA comment).

Notwithstanding the above, the calculations themselves appear to be conservative and biased toward a higher groundwater discharge volume and, consequently, a smaller dilution fraction. For example, the length of the breached sheet pile area accounts for the entire length of the wall, even where it runs parallel to the direction of groundwater flow and would presumably be subject to reduced discharge. Although very conservative, this assumption appears to be relatively reasonable and supportable.

Response: It should further be noted, as an additional conservative assumption, the assumed hydraulic gradient within the Calumet aquifer sands was based on October 2012 and July 2013 Lake Michigan water levels (576.57 feet MSL and 577.72 feet MSL, respectively). As indicated in Appendix A, the long-term average Lake Michigan water level is 578.77 feet MSL. As such, the actual long-term average hydraulic gradient across the Former Coke Plant site is likely lower than the assumed value, which would result in a decreased groundwater discharge rate and therefore an increased dilution factor.

The calculations also assume that a certain amount of groundwater leaks through the sheet pile revetments. Rather than use the modeled hydraulic conductivity of the sheet pile (0.0014 feet per day), the contractor assumes that conductivity of the sheet pile wall is approximately 10% of the hydraulic conductivity of the aquifer sands through which discharge occurs in the breached area (8.8 feet per day). The memo provides no justification for this relatively high hydraulic conductivity value for the sheet pile wall. Please explain, and if necessary, revise the calculations.

Response: *The overall hydraulic conductivity of the non-breached sheet pile barrier was assumed as 10 percent of the estimated hydraulic conductivity of the site-specific Calumet aquifer sands for the purpose of estimating a conservatively low dilution factor. Based on the modeled hydraulic conductivity of the sheet pile (0.0014 feet per day), the revised estimated rate of groundwater discharge through the breached and non-breached area of the sheet pile barrier totals 15.8 gallons per minute. Based on this revised estimated rate of groundwater discharge, the estimated groundwater-to-surface water dilution factor is 4,620, using the mixing zone demonstration.*

In consideration of the above USEPA comment, use of 25% of the stream design flow for constituent concentration comparison against chronic ecological criteria (i.e., 25% of the 7-day, 10-year low flow rate of 455 cfs) results in an estimated groundwater-to-surface water dilution factor of 3,250. Further, based on use of the stream design flow for constituent concentration comparison against acute ecological criteria (i.e., 1-day, 10-year low flow rate of 431 cfs), the estimated groundwater-to-surface water dilution factor is 12,300. In summary, regardless of the dilution factor calculation approach, the use of a dilution factor of 3,250 is acceptable and conservative.

327 IAC 5-2-11.4(a)(13) specifies how ammonia, chloride and metals dependent upon hardness shall be handled with respect to dilution. It is not clear that the calculations in Attachment 3 are consistent with the applicable regulations. Please explain, and if necessary, revise the calculations.

Response: *We recognize that 327 IAC 5-2-11.4(a)(13) specifies how ammonia, chloride and metals dependent upon hardness are handled with respect to surface water quality, rather than dilution. For the purposes of this refined evaluation of risk, site-specific surface water conditions were used (i.e., hardness = 141 mg/L, pH = 7.7, as shown in Table 2-1 of Appendix B).*

If you have any questions regarding ArcelorMittal's responses to USEPA's comments, please contact us at your convenience.

Sincerely,

Tecumseh Redevelopment, Inc.



Keith Nagel
VP, Environmental Affairs and Real Estate

Enclosure: Pre-Design Work Plan, Revision 1 (two copies)

cc: Cary Mathias, ArcelorMittal USA
Jeanne Tarvin, Ramboll Environ